

*Comparison of Recent and Former Observations of B.A.C. 793, and
Remarks on the alleged Variability of its Proper Motion.*
By Edwin Dunkin, Esq.

The few stars which are known to have an irregular proper motion have given to this subject a peculiar interest, especially since the disturbing causes in the cases of *Sirius* and *Procyon* have been discovered. When, therefore, a suspected variability in the proper motion of so small a star as B.A.C. 793 was pointed out by Professor Smyth (*Monthly Notices*, vol. xxxv. pp. 356–61), it appeared to me interesting to inquire whether any evidence could be deduced from other sources for or against this apparent irregularity of proper motion. Professor Argelander had previously, in volume vii. of the *Bonn Observations*, discussed the proper motion of this star in a most exhaustive manner, in common with 249 others, without detecting any variability calling for especial notice. But the tables given by Professor Smyth, formed from observations extending over thirty years, at the Edinburgh Observatory, exhibited such a decided and gradual change in the proper motion since 1837, both in R.A. and N.P.D., that it was thought worth while to examine the few Greenwich observations of the star to ascertain whether they gave any tendency towards a confirmation of Professor Smyth's numbers. Unfortunately, this star was not observed at Greenwich after 1858, and it was subsequently to that date that the start in the Edinburgh proper motion in N.P.D. began. The materials were therefore not very good for the comparison. But by dividing the observation-groups into intervals—much too short, however, to expect even moderate accuracy—it was shown that there was some general resemblance in the resulting Edinburgh and Greenwich values for proper motion in R.A.; but in the absence of later observations, it was impossible to pronounce, from this imperfect comparison, any decided opinion on the reality of the irregular changes in the amount of the proper motion given in Professor Smyth's paper.

The materials in hand have been, however, much increased by a series of observations since made at the Royal Observatory, and, through the kind permission of the Astronomer Royal, I have been enabled to avail myself of the results of this series, consisting of ten observations of B.A.C. 793 in both elements, and seven of a small preceding neighbouring star, Weisse's Bessel, (1) II. 453, which had also been previously observed four times between 1858 and 1863, evidently by mistake for the larger star. The comparison of the places of these two stars has given a valuable and independent result for the proper motion of B.A.C. 793. I have also officially received a paper sent by Mr. Stone to the Society—inserted in the present number of the *Monthly Notices*—in which he states that in 1837 the star B.A.C. 793 was observed at the Cape Observatory fourteen times in

right ascension, and that the Cape mean observed right ascension for that year differs as much as $0^s.315$ from that determined by the Edinburgh observations, a quantity sufficient, if the Cape right ascension were substituted for that of Edinburgh, to cause most of the apparent variability to disappear. It may be remarked, however, that the Greenwich observed mean right ascension determined from one observation in 1837, and four in 1838, reduced to 1837, January 1, is nearly the mean of the Edinburgh and Cape results.

It is not necessary at present to enter into more detail than what is required to determine the resulting proper motion from a comparison of the separate means of the observations of Lalande, Piazzi, Greenwich (1837-38), Greenwich (1845-46), and Greenwich (1852-58), with the ten observations made at the Royal Observatory in the latter end of 1875 and the beginning of 1876, the mean R.A. and N.P.D. being reduced to 1876, January 1. All the Greenwich observations having been corrected for the elapsed part of the proper motion depending on the fraction of the year, the different values for proper motion in Table III. refer in each case to a time half-way between the two epochs.

In Tables I. and II. the reduced mean R.A. and N.P.D. of the star at the epoch of each catalogue are given, and also for 1876, January 1, formed by applying to the former the geometrical precessions for the mean year multiplied by the number of years between each epoch and 1876. The R.A. and N.P.D. from Lalande and Piazzi's Catalogues are the corrected places used by Argelander in volume vii. of the *Bonn Observations*.

R.A. TABLE I.

Catalogue.	Mean Epoch of Obs. Cat.		No. of Obs.	Mean R.A. at Epoch of Cat.			Geometrical Precession.	Mean R.A. 1876, Jan. 1.		
				h	m	s		h	m	s
Lalande	1794.0	1800	1	2	25	7.010	3.1577	2	29	7.000
Piazzi	1800.9	1800	7	2	25	7.900	3.1577	2	29	7.890
Greenwich	1837.0	1837	5	2	27	9.017	3.1595	2	29	12.238
Greenwich	1855.0	1855	29	2	28	8.066	3.1605	2	29	14.437
Greenwich	1876.0	1876	10	2	29	16.920	...	2	29	16.920

N.P.D. TABLE II.

Catalogue.	Mean Epoch of Obs. Cat.		No. of Obs.	Mean N.P.D. at Epoch of Cat.			Geometrical Precession.	Mean N.P.D. 1876, Jan. 1.		
				°	'	"		°	'	"
Lalande	1794.0	1800	1	84	4	44.45	16.059	83	44	23.97
Piazzi	1800.9	1800	7	84	4	31.95	16.059	83	44	11.47
Greenwich	1845.0	1845	5	83	51	23.12	15.995	83	43	7.28
Greenwich	1855.0	1855	31	83	48	28.89	15.978	83	42	53.35
Greenwich	1876.0	1876	10	83	42	21.31	...	83	42	21.31

The annual proper motions deduced from the preceding tables are as under :

TABLE III.

Catalogues.	Mean Year for Proper Motion.	Proper Motion in R.A. s	Proper Motion in N.P.D. "
Lalande and Greenwich (1876)	1835.0	+ 0.1210	- 1.496
Piazzi „	1838.0	+ 0.1202	- 1.466
Greenwich (1837) „	1856.5	+ 0.1201	...
Greenwich (1845) „	1860.5	...	- 1.483
Greenwich (1855) „	1865.5	+ 0.1182	- 1.526

The star W.B. II. 453 having been observed several times between 1858 and 1863, the values of its proper motion have been approximately determined from a comparison of these with the recent observations to be -0.001 in R.A. and -0.09 in N.P.D. In comparing the relative positions of this star and B.A.C. 793 at the two epochs these proper motions have been applied to the places of W.B. II. 453 for the interval between the years 1855 and 1876. The following are the observed differences between the mean R.A. and N.P.D. of the two stars :

		Diff. of R.A. s	Diff. of N.P.D. "
B.A.C. 793 - W.B. II. 453	1855 Jan. 1	+ 37.281	- 13.28
„ „	1876 „	+ 39.777	- 44.76
Excess of B.A.C. 793 in 21 years		+ 2.496	- 31.48

From the direct comparison, therefore, of the observed places of these two stars we obtain the following independent values of the proper motion of B.A.C. 793, in both elements, which are probably not far from the true ones:

	Proper Motion in R.A. s	Proper Motion in N.P.D. "
1855, Jan. 1, to 1876, Jan. 1	+ 0.1189	- 1.499

These values are almost identical with those for the corresponding group in Table III.

Without entering into further detail, I think that the evidence given above is sufficient to warrant the conclusion that the proper motion of B.A.C. 793 has not really changed during the present century. The wonder is that the results for the different groups agree so well, considering that Lalande's place depends only on one observation in each element, and the com-

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Comparatively inferior instruments with which both Lalande's and Piazzi's observations were made. The proper motion in R.A. certainly shows a gradual diminution in the value from group to group, but by a quantity so minute that it probably owes its origin more to accident than to any other cause. If there had been any real changes similar to those indicated by the Edinburgh observations, they must have appeared in the resulting Greenwich values, which the excellent series of observations lately made at the Royal Observatory has enabled me to determine.

*Kenwyn, Kidbrooke Park Road, Blackheath,
1876. March 7.*

On a Supposed Variability of the Proper Motion of B.A.C. 793. By E. J. Stone, Esq., F.R.S., Her Majesty's Astronomer, Cape of Good Hope.

In the *Monthly Notices* for May 1875 there appeared an interesting paper by Professor C. Piazzi Smyth, in which an attempt is made to prove that the proper motions of the star B.A.C. 793 have varied sensibly since 1837. On reading the paper, I was much struck with the fact that the whole argument in favour of the variability of the proper motion turns upon the extreme accuracy of the Edinburgh observations made in 1837. I find that the star B.A.C. 793 was observed at the Cape no less than fourteen times in Right Ascension in the year 1837. Unfortunately, it was not also observed in North Polar Distance.

If we assume the proper motion in Right Ascension to be $0^s.120$, then we have:

$$1837 \text{ Jan. 1} \quad \text{R.A. of B.A.C. 793} = 2^h 27^m 9^s.155.$$

The number of observations upon which this result depends is 14, and the fraction of the year for which proper motion has been applied is 0.89.

It will be seen that the Right Ascension deduced from the Cape observations differs considerably from the result of the three Edinburgh observations.

If we bring up the Right Ascension deduced from the Cape observations with the proper motion $+0^s.120$, the following table will exhibit the excess of the computed results over the observed result given in Professor Smyth's paper:—